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## **Watchdog Relay 6HBWDOG1**

User Manual

September 2013

# 6HBWDOG1

Heartbeat Relay

## CHANGE HISTORY

Version	Date	Description
R01	9/2013	First Draft Revision



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#### LIMITED WARRANTY

The Company warrants the products it manufactures against defects in materials and workmanship for a period limited to two years from the date of shipment, provided the products have been stored, handled, installed, and used under proper conditions. The Company's liability under this limited warranty shall extend only to the repair or replacement of a defective product, at The Company's option. The Company disclaims all liability for any affirmation, promise or representation with respect to the products.

The customer agrees to hold Red Lion Controls harmless from, defend, and indemnify RLC against damages, claims, and expenses arising out of subsequent sales of RLC products or products containing components manufactured by RLC and based upon personal injuries, deaths, property damage, lost profits, and other matters which Buyer, its employees, or sub-contractors are or may be to any extent liable, including without limitation penalties imposed by the Consumer Product Safety Act (P.L. 92-573) and liability imposed upon any person pursuant to the Magnuson-Moss Warranty Act (P.L. 93-637), as now in effect or as amended hereafter.

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## INSTALLATION AND HAZARDOUS AREA WARNINGS

These products should not be used to replace proper safety interlocking. No software-based device (or any other solid-state device) should ever be designed to be responsible for the maintenance of consequential equipment or personnel safety. In particular, Red Lion Controls disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in any application.

In addition to operation and maintenance instructions the following items appear in the manufacturer's installation instructions.

1. "THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, D OR NON-HAZARDOUS LOCATIONS ONLY".
2. "WARNING - EXPLOSION HAZARD - SUBSTITUTION OF ANY COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2".
3. "WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS".
4. WARNING – EXPOSURE TO SOME CHEMICALS MAY DEGRADE THE SEALING PROPERTIES OF MATERIALS USED IN THE SEALED RELAY DEVICE.
5. FIELD WIRING CONDUCTOR MINIMUM INSULATION RATING: 75°C.
6. DEVICE IS OPEN-TYPE AND IS TO BE INSTALLED IN A TOOL ONLY ACCESSIBLE ENCLOSURE SUITABLE FOR THE ENVIRONMENT.

These products are operator interface units to be used within control panels. These devices are intended for use in Class I, Division 2, Hazardous Locations, industrial control applications. The enclosure shall be suitable for the location.

A minimum IP54 rated enclosure is needed for ATEX unless an equivalent degree of protection is supplied by the location.



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These products are to be used within control panels in hazardous locations. The enclosure shall be suitable for this location. Hot-swapping is not for use in hazardous locations.

**Note:** All information in this document applies to 6HBWDOG1 except where otherwise noted. Refer to <http://www.redlion.net> or online help systems for detailed product specifications and configuration settings.

## 1 General Information

### 1.1 Overview

The Red Lion heartbeat relay module is used as a failsafe system to monitor and shut down a PLC or RTU based automation system in the event of a malfunction in the processor controlling the system. A secondary safety check is the most economical way to achieve system safety shutdown.

This is accomplished by powering the control system through the internal 10A rated relay built into the watchdog module. Loss of processor control is detected by monitoring a discrete output signal designated as the "Heartbeat" which toggles on and off under processor control. If the processor malfunctions, the heartbeat will cease to toggle and the Heartbeat Watchdog Module will sense this failure and shut down the system by opening the relay powering the system.

The Heartbeat Watchdog Module is designed for extreme reliability, using no microprocessor or other programmable logic elements in its design. Using hard wired logic elements in place of CPU and memory based circuitry removes the possibility of program bugs or memory failure disrupting the operation of the module.

### 1.2 Specifications

#### 1.2.1 General Specifications

##### Environmental

Power Supply voltage: 12-24 VDC

Operating Temperature: -40 to +80 C (-40 to +85 C Storage)

Humidity: 5 to 95% RH (non-condensing)

##### Standards Compliance

Electrical Safety UL 508, CSA C22.2/142; IEC61010-1; CE

EMI Emissions FCC part 15, ICES-003, Class A; EN55022 IEC 61000-6-4; CE

EMC Immunity IEC61000-6-2 (EN61000-4-2,3,4,5,6,8); CE

Vibration: IEC60068-2-6

Shock: IEC60068-2-27

Hazardous locations (Class 1, Div II, Groups A, B, C, D), ISA 12.12.01, CSA C22.2/213, ATEX (Zone 2), IEC 60079-0, -15 (pending)

Marine and offshore tested and/or verified to meet various marine and maritime standards such as



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ABS, DNV No. 2.4 and Lloyds (pending)

Packaging Impact resistant Lexan® polycarbonate

Ingress Protection: IP30

Dimensions: 1.00" (2.54 cm) width x 4.00" (10.16 cm) height x 3.72" (9.45 cm) length

#### **Heartbeat Input**

Voltage range: 10 – 30 VDC

Input Polarity: Sourcing

Input isolation: 150 Volts

Guaranteed ON voltage: 9 VDC

Guaranteed OFF voltage: 1.0 VDC

Guaranteed OFF current: 1.0 mA DC

Input resistance (@24VDC): 2.6 Kohms

Input current (@ 24 VDC): 10 mA

Input Protection: High Impedance with overvoltage protection

Heartbeat Frequency: 1 – 50Hz\*

Heartbeat timeout (configurable): 1s to 200s\*

\* 1Hz may not work at fastest heartbeat timeout time of 1 second

#### **Output Circuit**

Relay type: Form C

Maximum switching voltage: 30 VDC

Rated operational current: 2A@30VDC



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### 1.3 Getting Started with Red Lion Controls Hardware

**Following these steps will make installation and start-up easier.**

**1. Mount the Hardware**

If you purchased individual components, consult [section 2](#) of this manual or other appropriate user manual for information on installing them into an enclosure.

**2. Connect Power and Heartbeat input**

Connect AC power cables from a suitable power source to the 24V DC power supply. The DC power connections are then attached to the watchdog relay bases as outlined in [section 5](#).

**3. Connect the PLC/instruments to the form C relay**

Please refer to section 5 to see how wiring should be completed.

**4. Configure DIP switch settings**

To configure the heartbeat timeout and boot delay set the dip switches on the side of the module according to the instructions found in [section 3](#) of this document.

**5. Apply Power**

Apply power to the watchdog relay power input and the form C relay that will power the PLC/instruments. This will power up the watchdog relay and the PLC/instruments, but since no heartbeat pulse is configured the form C relay will be deactivated after the boot delay time expires.

**6. Press the bypass button to enable bypass mode.**

Using a pen or a small screw driver press the bypass button on the front of the watchdog relay, once. The boot/bypass LED will illuminate and remain ON until the button is pressed again. The bypass mode will activate the form C relay so power will be applied to the PLC/instruments connected to the relay.

**7. Apply the heartbeat pulse from the SCADA system/Controller/RTU/PLC**

The heartbeat is usually generated by adding logic into the device that the heartbeat relay will be monitoring. For devices using an IEC61131-3 programming language a pulse can be created by adding a “blink” function. Define how often the pulse will cycle and set the output to a physical discrete output. The blink rate of the heartbeat pulse should be less (faster) than the heartbeat timeout configured in the dip switches.

**8. Press the bypass button again to disable bypass mode.**

Pressing the bypass button again will disable bypass mode. Since the heartbeat pulse is now present the relay will remain active.

**9. If You Have Difficulty**

If you experience startup trouble, go to the Getting Started icon in the I/O Tool Kit online help for some troubleshooting tips or go to <http://www.redlion.net>. If you still need assistance then please contact Red Lion Controls at +1 (717) 767-6511.



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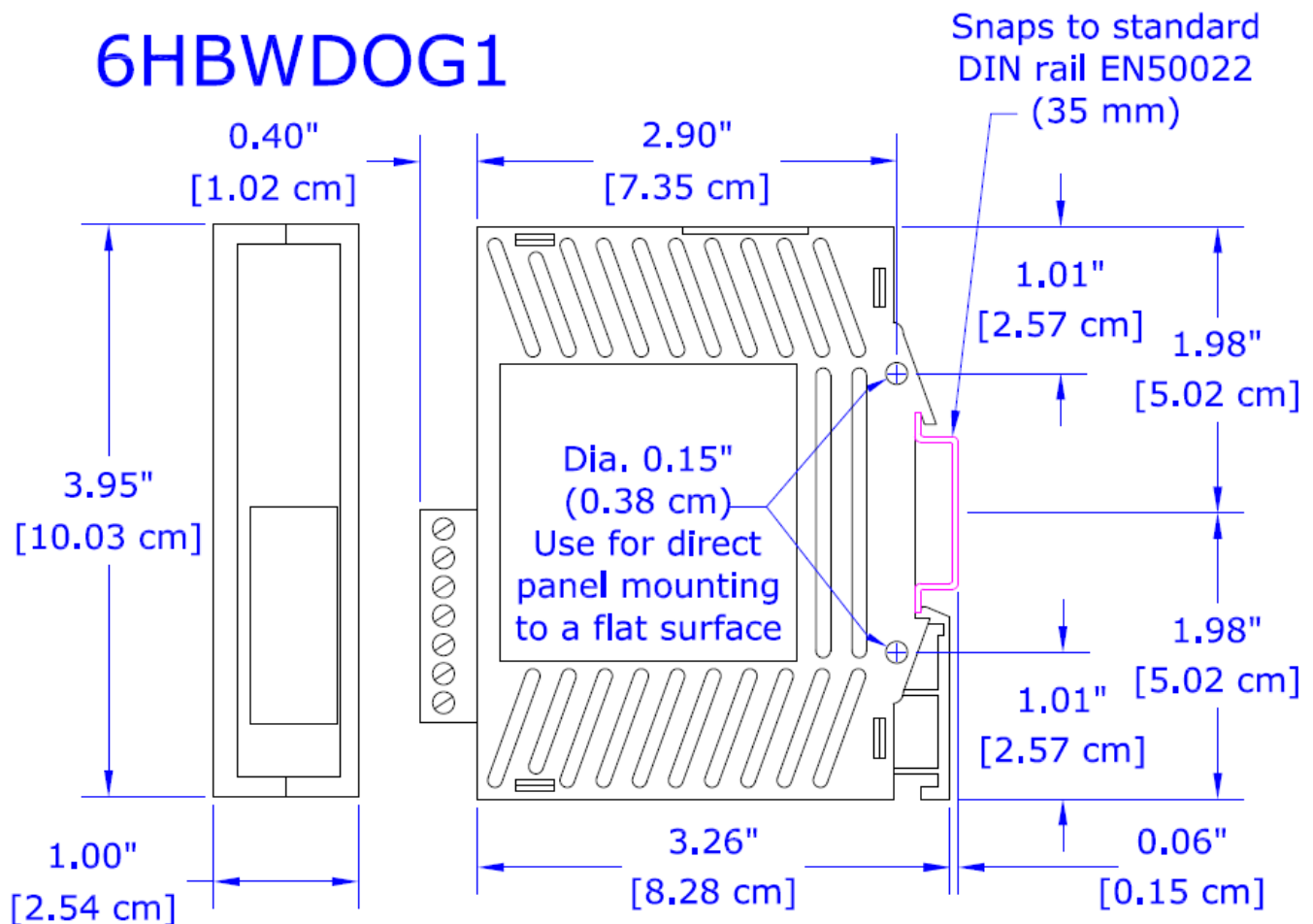
Heartbeat Relay

## 2 Assembly and Instruction

### 2.1 Panel Assembly

Most Red Lion Controls components snap onto DIN rail strips fastened to a subpanel. The watchdog relay can snap on the DIN rail vertically by hooking the top of the DIN rail mounting bracket on the top of the DIN rail, then pressing down (See the mounting diagrams below). The watchdog relay module is approximately 4" high and 1" wide (refer to the Mechanical Dimensions diagram below).

The screw terminals size is M3 and can support wire sizes of 30 to 12AWG. The recommended torque is 5 IN/LB.



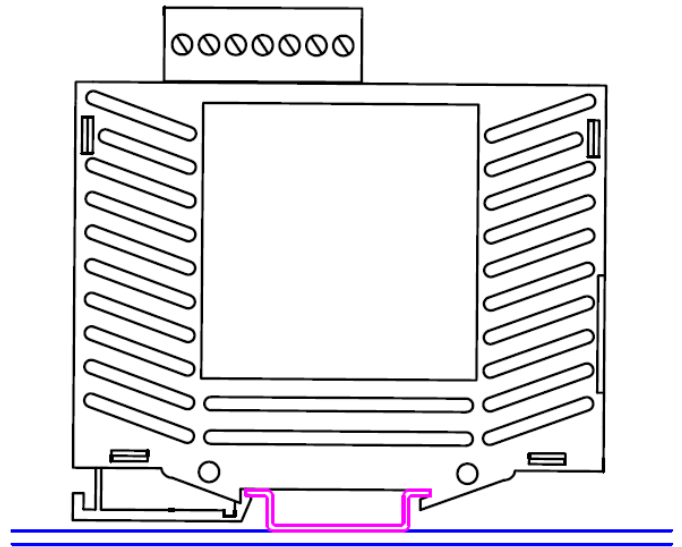
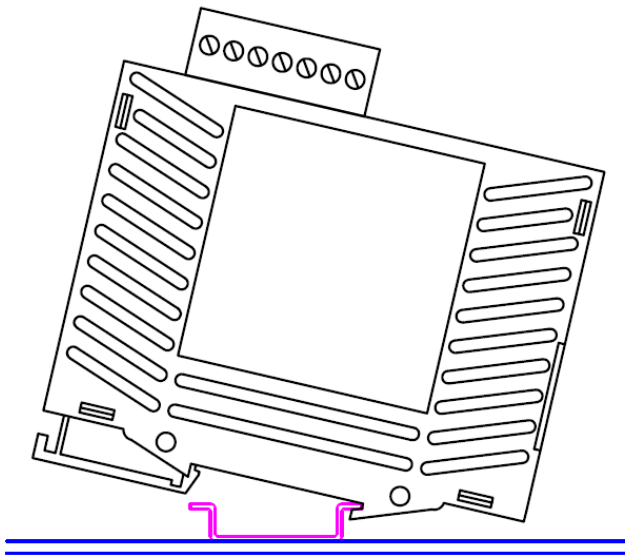
Mechanical Dimensions



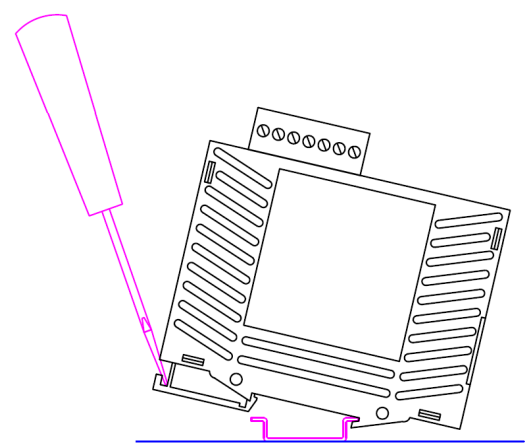
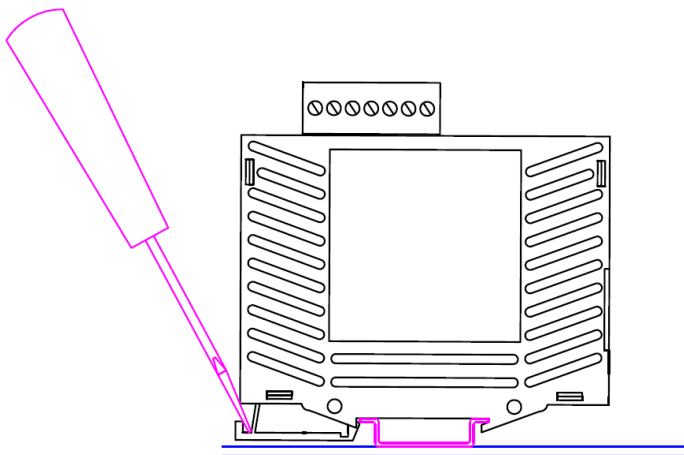
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Applying to DIN-Rail



Removing from DIN-Rail



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### 3 DIP-Switch Settings

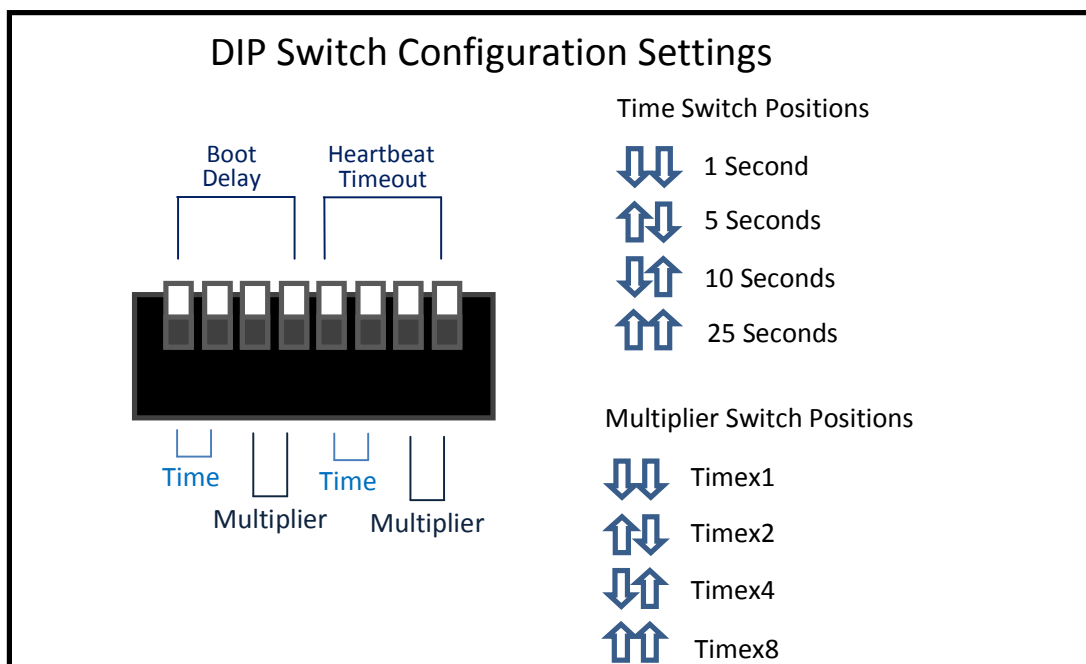
#### 3.1 Setting DIP-Switches

**Configuration:** Once installed in a system, the heartbeat signal must be configured. The controller is configured first to toggle the discrete output which is connected to IN+/IN- at the desired frequency. Once the controller is configured in this way the DIP switches located on the top of the Heartbeat Watchdog Module can be set to monitor the heartbeat signal. Two time settings are provided in the Heartbeat Watchdog Module:

**Boot Delay:** This time setting causes the Heartbeat Watchdog Module to wait a specific time after Power-Up or Reset before monitoring the Heartbeat Input. The purpose for this delay is to provide sufficient time for the system controller to boot up and begin toggling the heartbeat signal before the Heartbeat Watchdog Module begins monitoring the signal. This time delay setting should be configured to account for the worst case boot time of the system. If the boot delay is set too short, the Heartbeat Watchdog module will sense the lack of input signal changes while the system boots as a failure of the system.

**Heartbeat Timeout:** This time setting defines the maximum period between rising edges of the Heartbeat input signal which indicates proper operation of the system. If the Heartbeat input period exceeds this time setting, then the Heartbeat Watchdog Module will detect this as a failure of the system.

Each time setting is assigned to four DIP switches, and each group of four switches is divided into two pairs of switches. One pair is used to configure a base time and the other pair will configure a multiplier for that base time, so a wide range of times can be accommodated. The switch settings are shown in the diagram below:



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As an example, if the intention is to set a boot delay of 100 seconds, switches 1-2 would both be set in the up position for a time of 25 seconds, and switches 3-4 would be set down (3) and up (4) for a multiplier of 4. This setting provides 25 seconds x4 for 100 seconds boot delay.

Another example using the heartbeat timeout switches for a desired heartbeat period of 5 seconds would be: switches 5-6 set up (5) and down (6) for a 5 second time, while switches 7-8 would both be set down for a x1 multiplier. 5 seconds x 1 yields a heartbeat interval of 5 seconds. Power Wiring Alternatives



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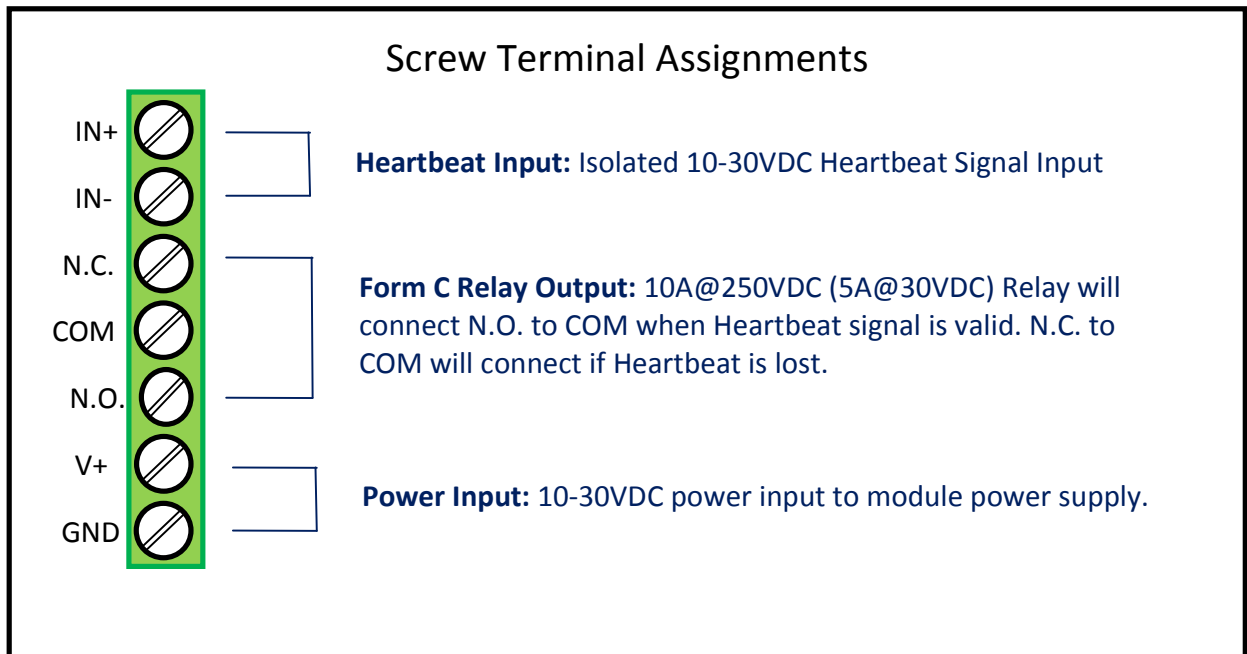
### Heartbeat Relay

#### 4 Power Requirements

Modules may be powered from any suitable DC power source of 10 to 30 VDC. Most frequently, EtherTRAK-2 I/O modules are powered from a +24 VDC industrial rated power supply such as the Sixnet ET-PS-024-02 (2 Amp) or ST-PS-024-05 (5 Amp).

#### 5 Module Wiring / Screw Terminal Assignments

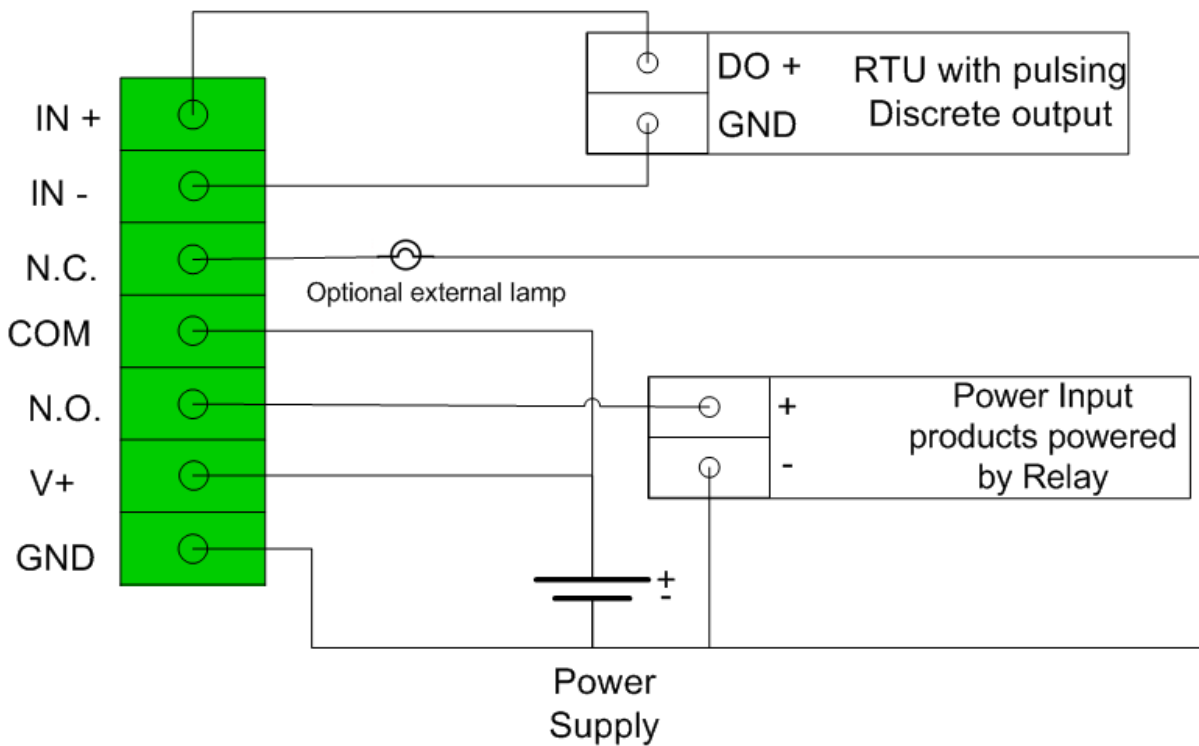
On the face of the Heartbeat Watchdog Module is a pluggable screw terminal block with retaining screws which secure the block to the module. The connections on the screw terminals are described in the diagram below.



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An example of wiring from watchdog module to power supply and external devices is below. When the heartbeat pulse is present on "IN +" input the product powered by the relay will be powered. When the heartbeat pulse stops for the configured heartbeat timeout the optional external lamp will be powered to indicate an alarm state.



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## 6 Safety Relay Status LED's and Buttons

**LED Indicators and Manual Control Buttons:** The face of the Heartbeat Watchdog Module has two pushbuttons and three LED status indicators. The pushbuttons are recessed to prevent accidental depresses. The location and function of these items are defined in the diagram below:

### Front Panel Indicators and Controls



**Bypass Button:** Pressing this button toggles on/off the bypass mode. When in bypass mode, the Heartbeat Monitor is disabled so that maintenance can be performed on the system without the watchdog input failure being detected and changing the relay state



**Power Indicator:** This indicator will illuminate whenever adequate power is supplied to the Heartbeat Watchdog Module.



**Boot/Bypass Indicator:** This indicator will illuminate when the bypass mode is active, and will also flash at a rate of 4Hz during the boot delay period.



**Failure Indicator:** This indicator will illuminate when the Heartbeat signal has not been detected during the configured period. The relay will open the normally closed contacts when illuminated.



**Reset Button:** Pressing this button causes the Heartbeat Watchdog Module to perform a hard reset, the same as if the power had been cycled to the module. The relay will close, followed by the normal boot delay time, after which heartbeat input monitoring will begin.



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## 7 Product Support

To obtain support for Red Lion products, call Red Lion Controls and ask for technical support. Our phone numbers are:

### **Red Lion Controls Worldwide Headquarters**

20 Willow Springs Circle  
York PA 17406  
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Phone: +1 (877) 432-9908  
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[support@redlion.net](mailto:support@redlion.net)

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00800 REDLIONS (00800  
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